



Newsletter

Volume 17, Number 5
September - October 2000

Director's Note

Many hundreds of visitors explore the Institute's Greenhouse each year, enjoying the flowers, fruits and foliage that are always in profusion. But the Greenhouse, with its 1300 different species of plants, is not just a showcase of biodiversity ... it is also an active research and education facility.

"Exotic Influences" — the cover story of this issue of the *IES Newsletter*— describes the work of Ms. Helen Dijkstra, a Rutgers University student doing her graduate research at the Institute. Over the summer, she did a major plant competition study in the controlled Greenhouse environment.

"Plant Power", a curriculum developed by IES educators for 3rd, 4th and 5th graders, was featured in a previous issue. In anticipation of the 11 elementary school classes signed up for Plant Power programs in the Greenhouse during November, bean plants are growing under different soil and light conditions, for use by the students.

Another Greenhouse program of great interest and importance is Integrated Pest Management (IPM). Since IPM was introduced in our greenhouse almost 10 years ago, its techniques have kept the facility virtually pesticide free, and this has benefited not only the plants but also the people who work with and enjoy them.

The Greenhouse is open year-round. I hope you visit often.

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Exotic Influences

One of the brightest reds in autumn's palette is on the vines that climb up utility poles, tree trunks and the sides of buildings. The vine is Virginia creeper. Cousin of the grape, its dark blue fruit is an important fall and winter food source for many birds and mammals.

Virginia creeper, wild grape and poison ivy are vines native to the northeastern United States. Japanese honeysuckle and Asian bittersweet are exotic species of vine that have become well established here. How do these different types of vines compete with native trees for growth resources, and does this competition affect the regeneration of forest gaps? IES graduate student Helen Dijkstra has made answering this question the goal of her doctoral research.

Forest gaps are created when some sort of disturbance — an old tree toppling, for example — makes an opening in the canopy. Suddenly sunlight falls on seedlings, shrubs and small trees whose growth has up to that point been limited by shade, and the plants begin to grow more rapidly. As remnants of historical plantings, there is a tendency for exotic vines to be more common than native vines in urban forests. Do exotic species grow faster? This is one question that Dijkstra is addressing, to help her determine the impact of young vines, both exotic and native, on their gap neighbors.

Vines reach toward the light by climbing something else; in the forest, this "something else" is generally another plant. Some vines are "twiners", a growth pattern that eventually can strangle the supporting plant. Less destructive are those vines that climb by sending out grasping tendrils. Dijkstra hypothesizes that exotic species of vine, which are primarily twiners, compete more aggressively with saplings and that this increased competition leads to slower tree regeneration in forest gaps. Data from field studies in Baltimore and controlled experiments in the IES Greenhouse will help her investigate this hypothesis.

Since vines tend to be primarily tropical and sub-tropical plants, there hasn't been much research done on Temperate Zone species. A scientist on the Institute's Baltimore Ecosystem Study (BES)*, this past summer Dijkstra began competition manipulation experiments at 18 gap sites in tulip poplar/oak forests in the city's urban parks. She spent two days a week in Baltimore, beginning an experiment to measure shoot and root competition using different combinations of tree saplings and exotic and native vines, assisted in her field study by BES research assistant Kim Mead and Research Experiences for Undergraduates' student Janel Vaughan. Her field work in Baltimore will end in fall 2001.

Since Dijkstra also needed to do experiments in a carefully controlled environment, which is difficult out-of-doors, she did a summer-long study in the Greenhouse. Setting aside a section of Unit 7, all the way down the pathway from the tropical unit so popular with visitors, she planted 180 pots in different configurations of vines — Japanese honeysuckle, Asian bittersweet, wild grape and Virginia creeper — and red maple seedlings. She tested root competition by planting a vine and a sapling in the same pot but

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In Helen Dijkstra's experiments to determine the effects of exotic and native vines on forest regeneration, senescing leaves had to be kept with their parent plants so that final measurements of total leaf area would be accurate. Here, at her research area in the IES Greenhouse, Dijkstra saves fallen leaves in plastic bags attached to the parent plant's pot.

* For information on the Baltimore Ecosystem Study, visit its Website at www.ecostudies.org/bes.

Where Have All the Flowers Gone?

by Wendy Ward

Most of us look forward to seeing the seasons change. We await the arrival of migrating birds and the blooming of woodland flowers in spring. We watch as the sun rises higher in the sky each morning, and listen as the songs of bullfrogs fill the air on early summer evenings. At this time of year, as autumn makes its presence known, we anticipate brilliant foliage and the honking of Canada geese, and, as the leaves fade from the bright reds and yellows to brown and the temperatures steadily drop, we watch as ponds freeze and the first snow falls.

A perfect place to watch the progression of seasons is the Fern Glen at the Institute of Ecosystem Studies. The Fern Glen is a wetland microcosm, a unique assemblage of habitats whose seasonal patterns and processes reflect those of other wetlands, small and large, across the northeastern United States. What should visitors to the Fern Glen know, at this time of year, about what's going on around — and under — them as they walk paths and boardwalks?

As autumn begins, shortening daylight hours and dropping temperatures signal to plants and animals that the less favorable conditions of winter soon will be approaching. The sun is no longer shining with the warmth and intensity of the past season, and the excitement and passion of summer is replaced by frigid winds and quiet stands of dead vegetation. Life may appear to come to a screeching halt in this desolate and frozen landscape, but deep under the soil and fallen leaves, snuggled away under rocks and logs and buried beneath the mud of the pond, it persists. Animals and plants are sleeping, lying dormant, waiting for the sun's warmth to return and wake them from their annual slumber.

Hibernation — sleeping through the winter — is how some animals respond to cooling weather and dwindling sunlight; it is their way of coping with winter's freezing temperatures and food shortages. When these animals hibernate, their body's metabolism slows so that they require much less energy to stay alive. Heart rate and respiration drop to only a couple of beats and breaths per minute, and in this dormant state animals can remain asleep for several months. Amphibians and aquatic turtles, common in the Fern Glen and in other wetland areas, hibernate through the winter, burying themselves deep into mud and debris. This layer of insulation keeps them warm and able to survive the freezing of their watery home.



AmeriCorps member Wendy Ward (left) and IES native plant gardener Judy Sullivan look for signs of fall in the Fern Glen.

Terrestrial amphibians and reptiles dig deeply into the leaf litter of the forest floor or congregate under rocks or logs; scientists use the term "brumation" for this inactive period in a reptile or amphibians life. Some amphibians, like the wood frog and the spring peeper, can even tolerate varying amounts of freezing of their body fluids: they produce their own "antifreeze" that inhibits tissue damage caused by freezing.

Plants prepare for winter in many different ways depending on the habitat conditions and the heredity traits of the particular plant. Mullein and primrose, for example, remain green throughout the winter, producing a flat circle of ground-hugging leaves called a rosette. This tight rosette maximizes the use of available sunlight required for photosynthesis, and also offers protection from the cold by acting like a mulch to maintain consistent soil temperature. Other plants become dormant, the horticultural equivalent of hibernation, to survive the harsh conditions of winter. They shut down their above-ground activities and transport all their energy and nutrients deep into their roots. Protected by warmth held in the soil, the roots remain alive underground and in spring the plants use their stored nutrients to send

up new shoots. Goldenrod and aster are two common perennial flowers whose roots remain alive over winter to produce new plants each year. Annual plants, on the other hand, die off completely after the first frosts, but the seeds they set, usually at the tips of their stalks, will be dispersed in late winter or early spring to germinate when conditions are right.

As winter begins to lose its grip, the Fern Glen and its fellow wetlands still look like brown and lifeless habitats. Ponds remain covered with a layer of ice, and the earth seems hard and impenetrable. It's difficult to imagine that in a few short weeks the woodland floor will be covered with the blooms of wildflowers including hepaticas, trilliums and spring beauties. Buds will be opening on the poison sumac and swamp azaleas, fiddleheads of native ferns will be pushing their way through the softening ground, and frogs and toads will be laying gelatinous clumps of eggs.

Whatever the mode of response to seasonal change, such adaptations have allowed animals and plants to survive and prosper in an otherwise often-hostile environment. These processes have evolved over hundreds of thousands of years in response to cyclical natural phenomena. Summer will always follow spring and fall will come after that, and the spring beauties, whose sleeping roots are nestled safely underground during the fall and winter months, will continue to break through the thawing soil each spring as winter fades to memory.

* * * * *

Wendy Ward was an AmeriCorp Member, through the Youth Resource Development Corporation, who came to the Institute in late fall 1999 to work with Judy Sullivan, the IES native plant gardener. During the warmer seasons, she explored woodland and wetland sites, identifying native plant species and monitoring their maturation. When seeds were ripe, she collected them and sowed them at the Greenhouse for subsequent planting in the Fern Glen. While her "subjects" were dormant, she developed a set of Fern Glen activity sheets. One for each season, these sheets will help children who visit the Fern Glen with their parents become more aware of what's going on around them. Beginning in December they will be available at The Ecology Shop.

Ms. Ward left the Institute at the end of September 2000 to pursue a career in veterinary medicine.

Dr. Pace Appointed IES Assistant Director

In September, Dr. Michael Pace was appointed to the new position of Assistant Director. His responsibilities will include coordinating future development efforts at the Institute.

Dr. Pace joined the Institute's scientific staff in 1986. His research focuses on food webs in aquatic ecosystems and includes studies of the Hudson River, experimental lakes in the Midwest, and land-lake linkages in the Adirondack Mountains. During Dr. Likens' sabbatical in 1996, Dr. Pace served as Acting Director, and as such worked closely with the IES Development Office during the early stages of the Institute's capital campaign.

For three years, under the leadership of Ms. Jan Mittan, the Development Office worked hard to achieve its capital campaign goal of \$6 million to build a new laboratory building and establish the endowed G. Evelyn Hutchinson Chair in Ecology. The drive ended successfully in December 1999: the laboratory soon will open its doors, and



Dr. Likens has been named to the endowed chair (May-June 2000 issue of the *IES Newsletter*). Now, the Institute has begun to lay the groundwork for its post-campaign development program, to sustain the momentum generated by the campaign and to continue to generate interest in IES and its science among

members of the community. One of Dr. Pace's immediate tasks is the recruitment of a new Development Officer to replace Ms. Mittan, who left the Institute in July.

Dr. Pace, who will continue to do his research on aquatic ecology, is looking forward to having new opportunities to talk with people about the strengths of the Institute's program. He did this recently, when he joined forest ecologist Dr. Charles Canham to host the mid-October "Autumn Glory" hike for Aldo Leopold Society members. "Membership in The Institute's Aldo Leopold Society is now approaching 200," says Dr. Pace. "We've generated tremendous interest (in our programs), and we want to sustain that momentum and continue to attract new members." High on Dr. Pace's list of development goals is finding ways to increase funding for the Institute's graduate education programs (*ed. note: As of October 2000, 70 masters and doctoral level students are doing their graduate work at the Institute*).

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separating the growing plants to prevent twining and thus eliminate any effects of above-ground competition. She tested above-ground competition by planting a vine and a sapling in separate but adjacent pots and training the vine so that it used the sapling for support. She tested for combined effects of below- and above-ground competition by planting a vine and a sapling in the same pot and not separating the growing plants. These treatments were repeated for the four vine species. Experimental controls were pots with red maple saplings growing alone.

Dijkstra's other experiment in the Greenhouse was designed to determine the effect of nitrogen on the vine-sapling relationship. In her plantings she used sand instead of potting soil, since sand is an inert substrate and supplies no nutrients to affect the results of the experiment. She added slow release fertilizer to all the pots to ensure uniform distribution of nutrients necessary for growth, then created two levels of nitrogen availability by adding a high concentration of ammonium nitrate to half of the pots and a low concentration to the other half.

Autumn comes to the Greenhouse just as it does to the out-of-doors, and when Dijkstra's plants showed the first signs of senescence, she harvested them. She will analyze these plants in the IES laboratory during the coming months. Do vine species grow differently depending on the level of nitrogen? By comparing biomass, number of leaves and length of vine, she hopes to answer

this question. She will assess root competition between vines and saplings by using an instrument called a carbon-nitrogen analyzer to measure the nitrogen content of the red maple seedlings, and by measuring seedling biomass — determined by drying out the plant and then weighing it. Comparison among saplings from different growth and substrate treatments will indicate what effects the vines had on the saplings' growth; the difference — if any — in above- and below-ground competition; and the relative importance of nitrogen. Dijkstra's data also should help her answer a question long debated by ecologists: does increased nitrogen have its greatest effect on shoot competition or on root competition?

Dijkstra's research has direct applications to the management of exotic plant species. "There aren't that many native vines," she explains, "and with the introduction of exotic plant species we've doubled the number of vines in our forests." Are exotics merely "more vines"? or are they actually more

aggressive competitors when they move into an area? "With today's rapid urbanization," Dijkstra continues, "there is increased fragmentation with greater 'edge effect', and more exotics will be introduced to forest interiors." How concerned should we be about these species and their interactions with native saplings? Findings from this study will describe more precisely what happens when these non-native species move into forests.

* * * * *

Helen T. Dijkstra is a doctoral candidate at Rutgers University; Dr. Steward T.A. Pickett, IES plant ecologist and principal investigator of the Baltimore Ecosystem Study, is her thesis advisor. She has a master's degree in horticulture, and has had previous experience doing experimental work in greenhouses. She gives special credit to David Bulkeley and Becky Curtis, greenhouse manager and greenhouse technician II respectively, for the excellent care they provided her vines and seedlings.

HOLIDAY SALE WEEKEND

Friday and Saturday, Dec. 1 and 2: 10 a.m. - 4 p.m. • Sunday, Dec. 3: 11 a.m. - 4 p.m.

Gardening books and tools ... wind chimes ... puppets ... puzzles ... games ...
holiday plants ... tropical plants from the IES Greenhouse ... candles ...
useful, fun and educational gifts for all ages ...
light holiday refreshments

• Extra 10% discount for IES members on all regularly priced merchandise, except books •

Questions? Contact Su Marcy at The Ecology Shop

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JILL CRAWFORD

Approximately 12,000 years ago, near the end of the last Ice Age, a mastodon died in the part of New York's Hudson Valley that is now Hyde Park. This particular mastodon, who in life had stood 8 - 10 feet high at the shoulder and weighed 4 - 5 tons, reappeared last summer when excavation to deepen a backyard pond turned up leg bones and tusk fragments. Work in late summer and early fall 2000 by the Paleontological Research Institution (PRI) and a number of local volunteers led to the discovery and excavation of the skull, the rest of the tusks, the pelvis, a foot, vertebrae and other bones. These have been transported to PRI, in Ithaca, N.Y., where they will be preserved and studied.

Joining the group of volunteers were a number of Institute employees who used some of their vacation time to help with this historic, not to mention huge, effort. Dave Lewis, a research assistant on an atmospheric deposition study, coordinated IES participation in the event. Above, Chloe Keefer (manager of information services) and Jeremy Miller (program assistant, Ecology Field Programs) sift through buckets of mud feeling for any small bones, as well as for twigs and stems that may have been browsed by the mastodon. (They found none of the former, but many of the latter.) Keefer adds, "We believe that we may have found some mastodon hairs, but that was just speculation — not verified by an expert, but exciting!"

Calendar

CONTINUING EDUCATION

For fall 2000 program information, or to request a catalogue, call the Continuing Education office at 914-677-9643. Programs during November and December include*:

Gardening

Nov. 18: **Moss Gardens**

Natural Science Illustration

Nov. 19 and Dec. 17: **Seasonal Plants in Watercolor - Special Topics**

Natural Crafts

Nov. 4: **Holiday Stencil Table Runner**

Nov. 18: **Festive Dried Flower Arrangement**

Dec. 2: **Fresh Green Holiday Wreath**

Dec. 16: **Creating a Holiday Centerpiece**

* Visit a new link on the IES Website, (www.ecostudies.org/cep), in December for the complete winter course list and online registration.

IES SEMINARS

Free scientific seminars are held each Friday from September until May, at 11 a.m. in the Auditorium, unless otherwise noted.

Nov. 3 (10 a.m.): **Models of Mast-Seeding and Its Effects on Gypsy Moth Populations and Lyme Disease Risk.** Dr. Eric Schaubert, IES

Nov. 9 (Thursday): **Spatio-temporal contingencies in Oldfield Succession: Conclusions from a Long-term Comparative Study.** Dr. Sandor Bartha, Institute of Ecology and Botany, Hungary

Nov. 17: **Revisiting Pavlovsky's Natural Nidality: The Ecology of Predicting Disease Outbreaks.** Dr. Gregory Gurri-Glass, Johns Hopkins Univ.

Dec. 1: **Nutrient Processing in Intertidal Creeks: Who's in Control?** Dr. Richard Dame, Coastal Carolina University, South Carolina

THE ECOLOGY SHOP

New in the Shop ... pearly mussel note cards ... spice mug mats ... porcelain art jewelry ... **for children** ... rock balls ... kaleidoscope kits ... **in the Plant Room** ... terra cotta pot feet ... brass-and-tin watering cans ... weathersticks

Senior Citizens Days: 10% off on Wednesdays

• Gift Certificates are available •

HOURS

Winter Hours: October 1 - March 31

Public attractions are open Mon. - Sat., 9 a.m.-4 p.m. & Sun. 1-4 p.m., with a free permit.

(Note: The Greenhouse closes at 3:30 p.m. daily.)

The Ecology Shop is open Mon.- Fri., 11 a.m.-4 p.m., Sat. 9 a.m.-4 p.m. & Sun. 1-4 p.m.

(The shop is closed weekdays from 1-1:30 p.m.)

• Free permits are required for visitors and are available at The Ecology Shop or the Education Office before 3p.m. daily.

MEMBERSHIP

Join the Institute of Ecosystem Studies. Benefits include subscription to the newsletter, member's rate for courses and excursions, a 10% discount on IES Ecology Shop purchases, and participation in a reciprocal admissions program. Individual membership: \$40; family membership: \$50. Call the IES Development Office at 914-677-5343.

The Institute's Aldo Leopold Society

In addition to receiving the benefits listed above, members of The Aldo Leopold Society are invited guests at spring and fall IES science updates. Call the IES Development Office at 914-677-5343.

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... for education, general information and The Ecology Shop:

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Street address: Gifford House Visitor and Education Center, 181 Sharon Tpke. (Rte. 44A), Millbrook, N.Y.

... IES Website: www.ecostudies.org

For information on current IES public events and attractions,

visit: www.ecostudies.org/welcome/ThisWeek.html.

For garden tips, follow the link to the Perennial Garden Archives.